

REMARKS/ARGUMENTS

Favorable reconsideration of this Application, as presently amended and in light of the following discussion, is respectfully requested.

This Amendment is in response to the Office Action mailed on November 18, 2004. Claims 1-24 are pending in the Application and stand rejected. Claims 1-16 and 21-24 are amended by the present amendment.

Summarizing the outstanding Office Action, Claims 4, 5, and 6 were rejected under 35 U.S.C. §112, second paragraph. Claims 1-24 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Makino et al. (U.S. Patent Publication 2003/0097193, hereinafter "Makino") in view of Japanese Publication No. 2000-047547, hereinafter "the '547 publication," and Bessho et al. (U.S. Patent Publication No. 2003/0128999, hereinafter "Bessho").

Applicants thank Examiner Karen Masih for the courtesy of an interview extended to Applicants' representative on December 28, 2004. During the interview, Amendments to the claims as herein presented were proposed, and arguments as hereinafter developed were presented.

As explained during the personal interview, Makino's control system appears to be based on "a linear encoder 24 with a linear scale 25 so that a relative [linear] position is calculated by counting the number of pulses corresponding to travel,"¹ "a position detector 11 so as to detect a stage position,"² difference of torque values,³ or a combination of velocity and torque inputs and calculations.⁴ Such conventional controllers were discussed in

¹ Makino, page 3, paragraph [0033], emphasis added.

² Id., paragraph [0036].

³ Id., paragraph [0038].

⁴ Id., paragraph [0046].

Applicants' specification.⁵ In the '547 publication, as summarized in Applicants' specification, an angular velocity is detected based on an output pulse signal of an encoder.⁶ Bessho was cited for disclosing an image carrier, a photo sensitive drum, a transfer belt, a toner image, and an optical system. None of these prior art references teach or disclose the detection of an angular displacement as originally recited in Claim 3 and presently amended Claims 1, 16, 22, 23, and 24.

One of the problems associated with conventional controllers and control methods is that a displacement can be measured only after an encoder having a resolution finer than double the variation amplitude of the target is used,⁷ thereby increasing the cost of the final equipment incorporating such controllers. In addition, angular and linear velocities can only be measured by detecting time changes by measuring a number of reference pulses at intervals of pulse signal output from the encoder or a marker sensor. Thus, in order to increase accuracy, it is necessary to increase the interval between pulse signal outputs from the encoder or to decrease the period of a reference pulse, thereby requiring high-frequency reference pulses as discussed in Applicants' specification.⁸

In the present invention, an angular displacement difference is used instead in a motor controller so that the velocity of an object is maintained constant, thus eliminating, or minimizing, the need for high-frequency reference pulse generators, and thereby increasing the accuracy of the control system by orders of magnitude.⁹

An agreement was reached during the personal interview that the cited prior art references of record do not teach or disclose the subject matter of Claim 1, if amended to recite a difference between the amount of "angular" displacement and a target value.

⁵ See, for example, specification, page 3, line 23 – page 4, line 8.

⁶ Id., page 2, lines 1-13.

⁷ Id., lines 19-24.

⁸ Id., page 46, lines 7-19.

⁹ Compare, as an example and not as a limitation, the accuracy of conventional systems (0.1% of a target angular velocity) to that obtained by the different embodiments of the present invention (0.001% of a target angular velocity). See, for example, specification, page 47, lines 3-23.

As Examiner Masih indicated on the interview summary (form PTO 413) "Representative suggested putting in subject matter of Claim 3 "angular displacement" for further limiting Claims 1, [16, 22,] 23, and 24 and differentiating from Prior Art. Representative also clarified drive roller and rotor and will correct any antecedent basis. Examiner proposed to add computer program to body of Claim 24 to differentiate it from Claim 23. Examiner agrees by putting angular displacement in Independent Claims, differentiates, from Prior Art. Examiner will perform further search."

Claims 1, 16, 22, 23, and 24 are amended to recite the language agreed upon during the personal interview. Based at least on the foregoing discussion, the results of the personal interview, and the present amendment to the independent claims, Applicants respectfully submit that the above-summarized obviousness rejection is now moot. Its withdrawal is respectfully requested.

As to the rejection of Claims 4, 5, and 6 under 35 U.S.C. §112, second paragraph, Applicants respectfully submit that the amendments to the claims submitted herein have overcome this rejection and respectfully request its withdrawal. Claim 24 now recites a computer program in the body thereof. It is believed that all pending claims are definite and no further rejection on that basis is anticipated. If, however, the Examiner disagrees, the Examiner is invited to telephone the undersigned who will be happy to work with the Examiner in a joint effort to derive mutually acceptable language.

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal Allowance. A Notice of Allowance for Claims 1-24 is earnestly solicited.

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Reply to Office Action of November 18, 2004

Should the Examiner deem that any further action is necessary to place this application in even better form for allowance, the Examiner is encouraged to contact Applicants' undersigned representatives at the below listed telephone number.

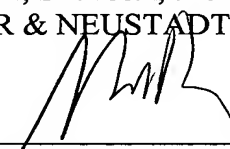
Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Customer Number

22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 06/04)



Gregory J. Maier
Registration No. 25,599
Robert T. Pous
Registration No. 29,099
Attorneys of Record

GJM/RTP/MQM/agm
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